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no relation to any other individual, by this means. The change of opinion amongst mycologists is manifested, as much as anything, in the new terms, or the appropriation of terms from other cryptogams, now in vogue. Conidia, spermatia, oospores, zoospores, pycnidia, protospores, etc., all relate to organs but recently recognized in fungi. And however much we may qualify the fact, however much we may doubt the evidence in special cases, we cannot ignore the conclusion that reproduction is very complicated, although very little understood in these extraordinary plants. Whilst admitting that the Cladosporium and the Macrosporium, the Alternaria, bottle-shaped cysts, and minute spermatia are all so intimately related with a certain species of Sphæria, that they can no longer be regarded as plants with a distinct autonomy and independent existence, we are unable to explain the relations which one bears to the other, or by what means each exerts its influence. The field for observation and research is a large one and promises a rich reward; all that is required is earnest and careful workers, in which *this*, of all European countries professing to be scientific, has hitherto been most lamentably deficient. How long shall such a reproach continue?—*Popular Science Review.*

REVIEWS.

Inland Fisheries.—The Report of the Massachusetts Commissioners * contains many items of encouragement for those who advocate restocking our rivers with salmon, trout, shad, alewives, bass, etc. Indeed the great run of shad in the Connecticut in the spring of 1870, has been by popular voice attributed to the artificial hatching of the fish in that river in 1867,—undoubtedly aided, however, by the law prohibiting the small mesh of the nets formerly used, which, being only two and a half inches, caught the fish of one and two years of age and of course at once diminished the catch of large fish. Under the new regulation a mesh of not less than five inches is allowed, and thus only the full grown three year old fish can be caught in any number. The close time of thirty-six hours (it ought to be forty-eight), in each week will give these fish a chance to spawn up the river, now that the fish ways are open, and we congratulate our Connecticut fishermen on the good days that are before them, owing to the affection of "Green's shad" (as they have been called, as Mr. Green was the person who stocked the river in 1867) for their place of birth.

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*Fifth Annual Report of the Commissioners on Inland Fisheries. 8vo pamph. pp. 77. January, 1871. State Document.

Many thousand young fry of the salmon, St. Croix salmon, Sebago salmon, togue and common trout have been placed in the rivers and ponds of Massachusetts and adjoining states during the past year, and we confidently expect to live to see good salmon and trout again abundant in our waters.

Much of the present report is taken up with the work of the Commissioners in bringing the owners of the Holyoke Water Co. to realize the fact that the fishes have a legal as well as natural right to a free passage in our rivers, and the Supreme Court having decided in favor of the fishes we trust that this case will settle all opposition to fish ways, which, as the commissioners state, the owners of dams are fast discovering, practically take little or nothing from their water power.

An account of the breeding and habits of the Black Bass by the late Mr. Tisdale (which we reprinted in our last number), and the valuable remarks made by Capt. Atwood, the veteran fisherman and Senator, on the habits and modes of capture of our sea fishes, conclude this very satisfactory report.

Mr. Atkins in his report as Commissioner of Fisheries of the State of Maine* enters very fully into the subject of fish ways, and in a most practical and common sense manner tells us what has been done, and still better, of the decided success of all the fish ways that were completed in time for the fish ascending during the season of 1870. From this report it can no longer be a matter of doubt but that properly constructed fish ways can be made at no very great cost, which not only will furnish a free passage to the fish, but also without materially injuring the water power of the parties owning the dams. Now that these points are secured practically, we shall hear but little about the "theory" regarding fish ways. Their construction on every salmon, shad and alewife river and stream in the country is now only a matter of time, for as it is proved that their construction is now simply a matter of dollars and cents, and also that the interest received by the community is very large on the small capital required to be invested, the most penurious of dam owners will be forced by public sentiment to keep the fish ways, which the laws oblige them to build, in good repair.

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*Fourth Report of the Commissioner of Fisheries of the State of Maine, for the year 1870. 8vo pamph. pp. 56. 2 plates. State Document, 1870.

Mr. Atkins also enters into the question of "close time" and shows that far better results would be attained by giving up the close time at the mouths of rivers and substituting a law regulating the depth of seines and pounds, thus allowing a portion of the fishes a chance to escape the nets and ascend the river. As it is impossible to enforce the present law without breaking up the fisheries, this proposed change seems to us a very wise and practical way of aiding the unjustly treated fishes in their eternal "struggle for existence."

An appendix to the Report gives an account of the fish breeding establishment of the Canadian Government, situated on Wilmot's Creek and under the charge of Mr. Samuel Wilmot. The two plates illustrating the various plans of fish ways in use in this country and in Ireland, will be found of much practical benefit to persons engaged in their construction.

Mr. Robert B. Roosevelt, who, of the three commissioners, seems to be the "writing man," assisted by Mr. Seth Green, who is preëminently the practical "fish breeder" of the United States, has given an interesting report of the work accomplished by the New York Commissioners during 1870. *

Mr. Green was sent up the Hudson in May, for the purpose of obtaining shad spawn for stocking the river above the Troy dam, but owing to there being no "close time" on this river, and the consequent capture of about all the shad at its mouth, Mr. Green only succeeded in obtaining a few ripe fish (many days not getting any, and the best day's fishing only brought him twelve). From what he did get he hatched out and put in the river about two and a half million of young fry, or "more than double the entire yearly yield of shad on the whole river." As a commentary on the condition in which Mr. Green found things on the Hudson, he simply states that unless a weekly close time of one or two days

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*Report of the Commissioners of Fisheries of the State of New York, for the year ending Dec. 31, 1870. 8vo pamph. pp. 32. State Document. 1871.

is enforced a net might as well be stretched entirely across the river and the fishery declared extinct. In which we think he is about right, for what use will it be to restock the rivers unless we have laws prohibiting excessive fishing, either by allowing the fish an unobstructed passage up the river for one or two days each week, or by not allowing the use of anything smaller than five inch mesh, and limiting the depth of all set nets, as proposed by Mr. Atkins.

During the year a large state hatching house was erected at Caledonia and placed under the charge of Messrs. Green and Collins, who very successfully carried out a number of experiments and hatched a large number of fish of various kinds. The attempt was made to hatch the spawn of the pike perch (Lucioperca) of Lake Ontario, but with little success, owing to the eggs being surrounded by a sticky substance and adhering so firmly together and to the sides of the pans as to prevent their being detached without destroying them. By constantly stirring the eggs for forty minutes after impregnation, Mr. Green succeeded in hatching a few. In a natural state he thinks the eggs are scattered as laid and adhere singly to the gravel, etc.

The experiment was tried of impregnating the eggs of the salmon trout with the milt of the white fish, and the eggs were hatched, bringing forth hybrids that have characters of both parents, which, at the time of writing the report, were thriving well. These fish will probably grow to good size, and may prove a very acceptable table fish, but it is hardly probable that they will be capable of continuing the race, as they are generic and not specific hybrids.

The Commissioners have hit upon the following expedient for obtaining young black bass and several other (they write it *hundreds*) species of fresh water fishes.

> "Although no means of hatching black bass and hundreds of other species has yet been discovered, another method was found for reaching substantially the same end. Every year large numbers of various kinds of bass and other fresh water fish pass into various State canals, either when they are very young, or else they spawn there and raise their young, which attain the size of four to six inches during the summer and by the fall, when the canals have to be drawn off preparatory to the cold weather.
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> Heretofore, when the latter event occurred, the larger fish were taken from the holes and indentations in the bottom by the fisher-

> men, with their nets, and sent to market, while the smaller fry were left to perish on the shore, or, when the holes dried up, to be frozen to death by the increasing severity of the winter.
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> Instead of permitting this terrible waste of valuable material, the commissioners made arrangements for saving a greater part of these little fish, and for distributing them throughout the waters of this State, whenever they are needed or can be used to advantage. In this way they have reached what bids fair to be an inexhaustible supply of fish that have heretofore defied the breeders' art."

This grand supply ground has been, by vote of the Canal Commissioners, placed entirely at the disposal of the Fish Commissioners.

The Fish Commissioners have also received authority from the Park Commissioners to use the ponds in Central Park for the purpose of experimenting on foreign fresh water fishes with the hope of introducing valuable species to this country. With this end in view they have started the experiment with the carp, so extensively used for food in Europe, Mr. Frank Buckland, the English Fish Commissioner, having promised his services. Mr. Roosevelt's letter to Mr. Buckland, however, shows that the New York Commissioners are not very well informed as to American ichthyology, as the following extract will exhibit.

> "The carp of all the eastern waters of America is a small, comparatively worthless fish, while the western carp is little known, its habitat not being even established, and it has never been described scientifically. In fact, if I had not seen it personally, I might almost doubt its existence. The European fish, on the contrary, is a large, fine fish, as we are informed, and will probably bear transportation as easily as the gold fish, which, as you know, is a similar species."

Perhaps in the next report we shall be informed *what* species of fishes are intended under the names of the *carp of all the eastern waters*, and the little known *western carp* that has *never been described scientifically!* As there are no species of the true carp genera (*Cyprinus** and *Carassius*) indigenous to North America,

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*There are two distinct species of fishes known as "Carp" in Europe. The true carp, *Cyprinus carpio* Linn., which is a native of Asia and was *introduced* to Europe, has always been kept in a more or less domesticated condition, producing several varieties and hybrids. This is the carp, or Cyprinus, of the early writers. The other species is the *Carassius vulgaris*, the *Cyprinus carassius* of Linnæus. This species is called the "Crucian" or Crucian Carp, etc., and is a native of temperate Europe and Asia, and very extensively domesticated and employed for food. Its close ally is the Gold fish or Golden carp, *Carassius auratus*, which has been introduced from China and domesticated in all civilized countries.

and as the Western fishes usually called carp belong to the sucker family and are pretty well known to ichthyologists, we are somewhat surprised at the broad statement made by Mr. Roosevelt to the contrary. Then the Commissioners seem to be quite neglectful in not looking up the stock of carp which, according to a letter published in DeKay's "Fishes of New York" (p. 189), were introduced in 1831 and '32 by Henry Robinson, Esq., of Newburgh, Orange Co., N. Y. Mr. Robinson states that he put some six or seven dozen carp, which he brought from France, into his ponds, and that "they increased to a superior degree" and (in 1841) he had "more than sufficient for family use." It is hardly possible that the Robinson fish could have become exterminated, as they seem to have thrived well, and Mr. Robinson also states in his letter that "For the last four years past, I have put from one to two dozen carp every spring in the Hudson river near my residence. They have increased so much that our fishermen frequently take them in their nets. They are larger than those in my ponds." In "Frank Forester's Fish and Fishing" (1851) p. 166 an account of these carp is given, and mention made of a law of the state protecting them for five years, etc. This is certainly a matter worth looking into by the State Commissioners.

The Report closes with several characteristic letters from Mr. Green.

THE MAY FLIES.*—This elaborate work is of use to entomologists generally as it gives a list, with brief descriptions, of many foreign species, and hence will be of much use in America. It will evidently prove, when completed, to be the standard work on this interesting family, and with its excellent plates, full synonomy and many critical notes, is a great step in advance of any paper yet published on this group. The author finds that the study of alcoholic specimens is absolutely necessary for characterizing the species, as the bodies shrivel in drying. We hope the students of other groups of delicate-bodied insects will follow Mr. Eaton's excellent example, and that insects preserved in alcohol will be found in all our entomological collections.

The number of described recent species of this family is about one hundred and seventy-eight, of which fifty-three are found in

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*A Monograph on the Ephemeridæ. By the Rev. A. E. Eaton. Part I. The Nomenclature of the Ephemeridæ. (From the Transactions of the Entomological Society of London, 1871.) 8vo. pp. 164, with six plates.